CLAIMS:

Please remove claims 1-22 (all claims) and add the following amend the claims as follows:

22. A laser apparatus for sustaining lasing cavity modes with an optical radiation of wavelength, λ_0, comprising:

a.) cavity structure means providing a surface of revolution, the surface thereby having a circular aspect;

b.) a reflective coating deposited on the surface of revolution, the coating providing a circular optical cavity, the optical cavity having a cavity interior with an interior index of refraction, the coating including at least one hundred thin film dielectric layers, the layers having alternating refractive indices, the alternating refractive indices at least as great as the interior index, the alternating refractive indices differing by less than 0.1, the coating providing greatest reflectance to the radiation at a preferred angle-of-incidence, so that the coating is substantially reflecting to the radiation only at approximately the angle-of-incidence, such that the radiation only contributes to the modes when the radiation is propagating at approximately the preferred angle-of-incidence;

c.) a gain medium in the cavity interior, the medium disposed for emitting the radiation into the modes; and,

d.) pumping means for excitation of the gain medium.

23. The apparatus of Claim 22, wherein the gain medium is a gas.

24. The apparatus of Claim 23, wherein the medium is pumped by a discharge.

25. The apparatus of Claim 22, wherein the gain medium is solid state.

26. The apparatus of Claim 25, wherein the outer layers of the coating include materials

for preventing internal reflection.

27. The apparatus of Claim 22, wherein the gain medium possesses a narrow fluorescence spectrum.

28. The apparatus of Claim 22, further comprising a central coupling structure located centrally in the cavity for coupling energy from the cavity.

29. The apparatus of Claim 28, wherein the coupling structure includes a substantially conical reflector for directing energy out of the cavity.

30. The apparatus of Claim 28, wherein the coupling structure includes a processing structure defining a process space within the coupling structure.

31. The apparatus of Claim 30, wherein the coupling structure includes means for introducing a photo-absorbing medium into the process space.

32. The apparatus of Claim 30, wherein the coupling structure includes means for passing an optical fiber through the process space for modification of the fiber..

33. The apparatus of Claim 30, wherein the coupling structure includes means for passing an optical fiber preform through the process space for modification of the preform.

34. The apparatus of Claim 30, wherein the coupling structure includes means for passing a gas through the process space for modification of the gas.

35. The apparatus of Claim 22, wherein the coating includes additional layers for performing additional functions.

36. The apparatus of Claim 22, wherein the coating includes a material with an optical absorption for limiting unwanted propagation in the structure.

37. The apparatus of Claim 22, wherein the coating is substantially reflecting to radiation of wavelength λ_1 only at a second angle-of-incidence, so that the structure may also sustain lasing modes with an optical radiation of wavelength λ_1.

38. The apparatus of Claim 22, wherein the surface of revolution is discontinuous.

39. The apparatus of Claim 22, wherein the surface of revolution comprises a spherical surface.

40. The apparatus of Claim 22, wherein the surface of revolution comprises a cylindrical surface.

41. The apparatus of Claim 22, wherein a selected area on the surface of revolution possesses lower reflectivity for coupling energy out of the cavity through the surface of revolution.

42. The apparatus of Claim 22, wherein the reflector is discontinuous.

43. The apparatus of Claim 22, wherein angle-of-incidence is approximately normal incidence.

44. A laser structure for sustaining preferred cavity modes with an optical radiation of wavelength, λ_0, comprising:

a.) cavity structural means, the structural means providing optical surfaces for forming an optical cavity;

b.) a reflective coating deposited on the optical surfaces, the coating providing an optical cavity, the optical cavity having a cavity interior with an interior index of refraction, the coating including at least one hundred-eighty thin film dielectric layers, the layers having alternating refractive indices, the alternating refractive indices differing by less than 0.1, the coating providing greatest reflectance to the radiation at a preferred angle-of-incidence, so that the coating is substantially reflecting to the radiation only at approximately the angle-of-incidence, such that the radiation only provides the modes when the radiation is propagating at approximately the preferred angle-of-incidence; and,

c.) a gain medium in the cavity interior, the medium disposed for emitting the radiation into the preferred modes.

45. A gas laser cavity structure for providing lasing cavity modes of a preferred wavelength, comprising:

a.) a cavity structure providing a spherical surface of revolution;

b.) an optical coupling structure located centrally within the cavity; the coupling structure providing means for coupling energy out of the cavity;

c.) a multilayer dielectric reflector deposited on the surface, the reflector defining an optical cavity, the reflector having an angle-dependence, so that the lasing cavity modes are substantially limited to radiation that intersects the coupling structure; and,

d.) a gain medium within the cavity, the medium disposed for emitting optical radiation into the lasing modes when the medium is pumped by pumping means.